Knowledge Ecosystem Recommendations

Overview

- This page is a resource to help stakeholders working along the COVID-19 evidence-to guidance- to action - to data - to evidence cycle improve their work processes and results (see diagram at the top of this page). The ultimately goal is to a soon as possible, improve COVID-19 care delivery and outcomes.
- The tables below are designed to aggregate **suggested approaches to enhancing activities within the COVID-19 knowledge ecosystem cycle to optimize processes and outcomes associated with these activities**. The recommended tools and approaches are being gathered and will evolve over time as stakeholder input is received and community consensus around best practices - and the pandemic itself - evolve.

Recommendation Table Listing

- Identify Studies
- Synthesize Evidence
- Produce Guidance
- Make Guidance Computable
- Implement Guidance
- Analyze Care Results
- Leverage Results Analysis (e.g., for Quality Improvement, Reporting, Evidence Generation)

Process for Populating Recommendation Tables

- Identify 'leads' for each table who are currently doing extensive, collaborative work around the ecosystem step.
- Leads provide pointers to what their collaborative communities to be high value resources for table cells
- Other Collaborative participants likewise add comments and suggestions about this emerging information
- Formal processes/criteria will be developed by the Collaborative for adding/vetting information in the tables to optimize their value and use (including defining explicit criteria for what belongs in each row), e.g.,
    - Input Sources:
    - Search Strategies:
    - Output Repositories:
    - Standards:
    - Initiatives:
    - Tools/Platforms:
    - Other Best Practices:

Recommendation Tables for Knowledge Ecosystem Steps

Identify Studies

	General Recommendations	Anticoagulation	Testing /Triage	Other (Long COVID, Vaccine, Steroids)
Key Definitions and Frameworks				
What to know/do (and why) Overview ('nouns and verbs' - what goes in rows below in each table are the 'lists' associated with this the bullets in this row)	include: what tools to use under what circumstance. Information about the item so people can match it to their need. -------------------- **Regarding Terminologies:** HL7 Project "Guidelines for a Standardized Terminology Knowledge base" **Regarding Value Sets** recommend the following process (applies to anticoagulation, testing /triage, vaccines, steroids, and any other topic): 1. Take inventory of what value sets you'll need (be specific) 2. Check Alliance website or Value Set Authority Center (VSAC), we might have already published some of them among the 600+ value sets 3. If certain value sets are not present or you are unsure, contact Victor Lee (Victor_Lee@ ClinicalArchitecture.com) to inquire or to request development Clinical Architecture and other Alliance collaborators are donating our efforts, and Clinical Architecture is leveraging its software tooling, hosting infrastructure, and manual labor to donate all of the COVID-19-related value set content to the public domain (i.e., completely free, no strings attached). That being said, we all have day jobs, so we appreciate having as much lead time as possible to fulfill requests. Happy to take questions.			

Input Sources	COVID specific systematic and rapid reviews • L*VE/Epistemonikos • COVID-NMA • COVID-END inventory • ESP COVID-19 Evidence Reviews COVID specific mixed (reviews and trials) • NIPH COVID-19 Living Evidence Map • EBSCO COVID-19 Information Portal • University of Michigan COVID-19 Best Evidence Front Door COVID specific Trials • Cochrane COVID-19 study register • ClinicalTrials.gov/COVID-19 • DoctorEvidence CORD-19 Dataset Search • EBSCO COVID-19 Information Portal		• NEWS2 predicts severity /mortality at admission • Annals IM, hospitalized patient trajectories • Sensitivity, Specificity Predictive Values of Tests for COVID-19 in ED • PREDI-CO Risk assessment tool	• For steroids systematic meta-review, 8 sources have been identified these are (MEDLINE, CORD-19, L-OVE /Episteminokos, NIH iSearch COVID-19, EuropePMC, WHO COVID-19 Database, EMBASE + Prospero)
Search Strategies				
Output Repositories				
Standards				

Initiatives	• Librarian Reserve Corps
	  • COVID-Evidence Project - building a database to gather all the evidence around a drug (University of Basil - currently focused on hydroxychloroquine, but model could be adaptable to other targets)
	  • Identification of sources to identify primary studies - validation study of specialized COVID-19 databases (systematic reviewers are going to different sources - this effort is to identify best practices)
	  • Advocate for librarian representation in searches and reviews - leverage skillsets /best practices in this work
	  [SLMC]: close gaps between needs that clinicians are seeing on the front line and topics covered in reviews guidelines
	• COKA Evidence/ Tools WG [Project Google Drive](work in process)			

Tools/ Platforms	• Indico's SaaS approach allows an efficient asynchronous, distributed volunteer workflow for traditional Title/Abstract and Full-Text screening based on PICO inclusion /exclusion criteria with client-defined conflict resolution.			
Other Best Practices	• Framework slides: Applying Standards to the Evidence Domain (from the COKA Evidence Ecosystem Liaison WG) • Add patient voice in the selection of the PICOTTS			

Synthesize Evidence

	General Recommendations	Anticoagulation	Testing /Triage	Other (Long COVID, Vaccine, Steroids)
Key Definitions and Frameworks	• includes evaluation of quality of evidence • also needs to address processing of real world evidence • [weave in ICER - search ISER opioids]			

What to know /do (and why) Overview	For people creating evidence syntheses		

	Content		
What to know /do (and why) Overview	- For people creating evidence syntheses - See if work on planned topic has been done already - search L*VE/Epistemonikos (2K reviews - cover many questions - only a fraction registered in PROSPERO; most reviews are out of date - only 3% have all the trials they should), PROSPERO for what's in the pipeline. Make sure that any existing reviews look at outcomes that are pertinent to your needs [leverage COMET - outcome measures], etc. that of interest for the need at hand. Very hard for user to identify a review that's up to date. Existing systematic reviews can be assessed for quality using the tools listed below (AMSTAR, DART, or Oxman-Guyatt). COVID-END repository of Best Evidence Syntheses can be helpful here. - Need to have access to raw data that fed into the review so it's more re-usable. - important to understand end-user needs so that the review can be aimed at addressing them - AHRQ has methods guides, Cochrane has them. Are there tools for this on COVID - e.g., Resources and tools for researchers considering and conducting COVID-19 evidence syntheses (From COVID-END Synthesizing WG) - Study Quality Assessments - For randomized trials (including open label), evaluate using the newest version of the RoB2 (15 March 2019) Source = https://www.riskofbias.info/ - For non-randomized intervention studies including cohort studies, evaluate using the newest version of the ROBINS-I (version 19 September 2016)Source = https://www.riskofbias.info/ - For case-control studies evaluate using the Newcastle Ottawa scale for case-control studies. (Note that the ROBINS-I has not yet been adapted for use with case-control study designs – but keep watch out for this) Source = http://www.ohri.ca/programs/clinical_epidemiology/oxford.asp - For cross-sectional studies evaluate using the NIH/NHLBI tool Source = https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools - For case-series studies consider evaluations using the Specialist Unit for Review Evidence (SURE) checklist. It is older and may have been replaced with newer tools. Source =https://www.cardiff.ac.uk/specialist-unit-for-review-evidence/resources/critical-appraisal-checklists - For guidelines, evaluate using AGREE II. https://www.agreetrust.org/agree-ii/ - For systematic reviews, consider using AMSTAR II: https://www.bmj.com/content/358/bmj.j4008 An alternative would be Documentation and Appraisal Review Tool (DART) https://www.wjgnet.com/2308-3840/full/v3/i3/142.htm Or an older tool called Guyatt-Oxman: https://cdnlinks.lww.com/permalink/jbjs/b/jbjs_2017_03_06_dijkman_48_sdc1.pdf - For organizations consuming evidence syntheses - For selecting/using synthesized evidence: Is there a GRADE evidence profile? Do they make quality assessments? How comprehensive are they? Search date -------------------- **Regarding Terminologies:**HL7 Project "Guidelines for a Standardized Terminology Knowledge base" **Regarding Value Sets** recommend the following process (applies to anticoagulation, testing/triage, vaccines, steroids, and any other topic): 1. Take inventory of what value sets you'll need (be specific) 2. Check Alliance website or Value Set Authority Center (VSAC), we might have already published some of them among the 600+ value sets 3. If certain value sets are not present or you are unsure, contact Victor Lee (Victor_Lee@ClinicalArchitecture.com) to inquire or to request development Clinical Architecture and other Alliance collaborators are donating our efforts, and Clinical Architecture is leveraging its software tooling, hosting infrastructure, and manual labor to donate all of the COVID-19-related value set content to the public domain (i.e., completely free, no strings attached). That being said, we all have day jobs, so we appreciate having as much lead time as possible to fulfill requests. Happy to take questions.		
Input Sources	- See Sources/Repositories from Identify Studies table - ClinicalTrials.gov/COVID-19; New pubmed interface; DoctorEvidence CORD-19 Dataset Search - PROSPERO - Indico for highly configurable data extraction	- Underlying justification and evidence tables (critically ill and acutely ill) from ASH Anticoagulation Living Guidelines - L*VE /Epistemonikos search on antithrombotics; can send email when new study /review/guideline is published. - Rapid Cochrane review on anticoagulation in COVID-19 patients - Systematic review on anticoagulants in COVID-19	BMJ EBM rapid review on COVID tests
Output Repositories	- SRDR+ - COVID NMA Project - COVID-END Best Evidence Syntheses Inventory ('best evidence syntheses' on clinical management) - reviews that are living, up to date, high quality and where there is a GRADE evidence profile. - LIVING Project - living systematic review of COVID-19 interventions; - L*VE/Epistemonikos, - VA Evidence Synthesis Program catalog of COVID-19 Evidence Reviews; - GIN COVID-19 Evidence Resources - EvidenceAid - Usher Network for COVID-19 Evidence Reviews		
Standards	- IOM Report: Finding What Works in Health Care: Standards for Systematic Reviews - EBM on FHIR/COKA (standards include: Evidence, EvidenceReport, EvidenceVariable, Group, Citation - Vocabulary Map for Evidence-related resources[Project Google Drive]) - AGREE II for rating the quality of guidelines [Add AMSTAR and all study quality rating tools here]		

Initiatives				• COKA Steroids for COVID-19 Systematic Meta-Review Protocol; slides about this effort
Tools/Platforms	• Resources and tools for researchers considering and conducting COVID-19 evidence syntheses (From COVID-END Synthesizing WG) • GIN COVID-19 Evidence Resources • SRDR+, Covidence, Distiller SR, RevMan, JBI Sumari • Doctor Evidence Analytics Tool • AHRQ EPC Methods Guides • COMET (Core Outcome Measures in Effectiveness Trials • Equator Network: Enhancing the QUAlity and Transparency Of health Research • STARR Decision Tool (for rapid review approaches)			
Other Best Practices	• COVID-NMA has initiated communication with all trialists to try to ensure consistent approaches e.g. selection of outcomes, reduction of risk of bias, and to invite them to contribute missing data. • Framework slides: Applying Standards to the Evidence Domain (from the COKA Evidence Ecosystem Liaison WG) • ACCP/CHEST notes that given the need for rapid guideline development in COVID (1-2 month timeframe), they do not have the resources needed to produce full GRADE guidelines in these topic areas. They have adopted a heavily modified approach to limit some of the steps of GRADE – given this, they typically issue "ungraded" recommendations related to COVID. Modification of the Rapid Guideline Development approach from GIN-McMaster: https://health-policy-systems.biomedcentral.com/articles/10.1186/s12961-018-0330-0			

Produce Guidance

	General Recommendations	Anticoagulation	Testing/Triage	Other (Long COVID, Vaccine, Steroids)
Key Definitions and Frameworks				

What to know /do (and why) Overvi ew	For people producing guidance:
	
	• make sure that recommendations include the most specific information possible on who/what/when/where/how (and why); bring guideline consumer stakeholders to the table very early in the process of developing guidelines to ensure that the recommendations will be helpful in meeting clinical needs - and be consumable in a computable fashion. (e.g., - have a knowledge engineer in the loop - see 'make guidance computable section below for details.)
	• Coding is important to support downstream computability efforts - (Need to lay out exactly what guidance producers need to know and do to make this - integrate guidance development with efforts to make computable)
	• For maintenance, i.e., 'living guidance' -
	    • Monitor literature (studies and systematic reviews) that relate to the focus of the guideline. Grade material is it becomes available. Don't start from scratch- leverage other efforts to process the upstream evidence. (include links in this guidance section back to pertinent tools in the 'upstream' supply chain tables above)
	    • Modify the guideline according.
	• GIN Library to register guidelines in process
	• PICO(TTS) paradigm
	• GRADEpro GDT
	• WHO-INTEGRATE evidence to decision framework
	• EtD Framework
	• mDelphi surveys to achieve consensus
	• GRADE for grading recs
	• GIN-McMaster Guideline Development Checklist
	• WHO Handbook for Guideline Development
	• Indico platform to assist in guideline development and dissemination. Unbundled database of guideline representation that allows precise version control, recommendation-specific database elements including appropriate use, field-level keyword/coding, and consensus management via rec voting/Delphi, form/general/text-specific external feedback. "Living" is achieved by selectively applying updates to the consensus management flow and into deliverable pathways which could include publication, mobile apps, integrated web pages, and any API integrated platform.
	• Many medical professional societies develop guidelines and each has its own manual, available on the society's website and/or published in their journal
	
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	Regarding Terminologies: HL7 Project "Guidelines for a Standardized Terminology Knowledge base"
	
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	1. Take inventory of what value sets you'll need (be specific)
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	3. If certain value sets are not present or you are unsure, contact Victor Lee (Victor_Lee @ClinicalArchitecture.com) to inquire or to request development
	
	Clinical Architecture and other Alliance collaborators are donating our efforts, and Clinical Architecture is leveraging its software tooling, hosting infrastructure, and manual labor to donate all of the COVID-19-related value set content to the public domain (i.e., completely free, no strings attached). That being said, we all have day jobs, so we appreciate having as much lead time as possible to fulfill requests. Happy to take questions.
			ACEP/EvidenceCare ED Severity Classification /Testing/Triage Tool	• KHN article on educati ng patient s about vaccin es

Input Sources	• See Output Repositories from Synthesize Evidence table		• ASH Living Guideline on COVID anticoagulation and underlying justification and evidence tables (crit ically ill and acutely ill) • NIH Guideline • AU living Guideline • NEJM vignette with expert opinion • INESSS (Institut national d'excellence en santé et en services sociaux, Montreal, Quebec) published a report in June: '' COVID-19 and thrombotic risks'' (h ttps://www.inesss.qc.ca/fileadmin /doc/INESSS/COVID-19/COVID-19_INESSS_Risques_Thrombothiq ues.pdf) • JAMA article on thrombosis in COVID-19	
Output Reposi tories	• Living Map of COVID-19 recommendations (Canadian Institutes of Health Research) • ECRI COVID-19 Guideline Resources • GIN will publish (has published?) a registry of guidelines in development (COVID and beyond) • ACCP/CHEST statements and guidelines related to COVID: https://www.chestnet.org /Guidelines-and-Resources/COVID-19/Guidelines-and-Statements.		• ACCP/CHEST has produced a guideline (expert panel report) on anticoagulation in COVID: https://jou rnal.chestnet.org/article/S0012-3692 (20)31625-1/fulltext?_ga=2. 74801362.1500575179.1606921932 -1458971356.1597085658	
Standa rds	IOM Standards: *Clinical Practice Guidelines We Can Trust*			
Initiativ es				
Tools/ Platfor ms	• GIN COVID-19 Guidance Resources • MAGICapp; • COVID-END Rapid Response Model and Tips/Tools • GRADE • International Patient Decision Aid Standards • 9/15/20 Annals IM article on COVID guidelines. • AGREE II for assessing guideline quality and reporting; • Africa Centre for Evidence Living Hub of COVID-19 Knowledge Hubs			

Other Best Practices	• The patient's voice should always be part of guideline and HTA development. Alternatively, include parents of children or other advocates and/or healthcare consumers. • COVID-END Recommending WG guidance on producing COVID-19 Guidelines [to be released soon] • 2011 NAM (IOM) Standards for Guidelines • Guideline development resources: GIN/McMaster Checklist, Australia Guidelines for Guidelines Handbook • Methodologies for the Development of CHEST Guidelines and Expert Panel Reports • "Developing an institutional health technology assessment framework: the example of principles for stakeholder participation", presents some recent developments in INESSS methods; • "HTA Ultra-rapid responses to inform decision-making during the COVID-19 pandemic: methodological development", summarizes the methods developed at INESSS since March to rapidly answer COVID-19 related questions for the Ministry of Health and clinicians in the health network in Quebec. • ACCP/CHEST reports that it has been helpful having a preset document format for COVID-related documents so guidelines have a similar structure and format across topic areas. This also allows for more rapid production and development.			

Make Guidance Computable

	General Recommendations	Anticoagulation	Testing /Triage	Other (Long COVID, Vaccine, Steroids)
Key Definitions and Frameworks	• [CPG on FHIR and BPM+ IGs do this separately - need to be combined and simplified (e.g., with helpful graphics); e.g., leverage L1-L4] • [Approach section from CPG on FHIR IG might be helpful in framing scope]			

What to know /do (and why) Overview	For people looking for guidance repositories:		Computable version of ACEP/EvidenceCare ED Severity Classification/Triage tool
	- COVID-END Inventory of Resources to Support Decisionmakers for evidence on public health measures, clinical management, health systems, and social and economic issues - GIN Library of Guidelines – to search for completed, planned, or in-development guidelines - ECRI COVID-19 Guideline Resources and ECRI Library for the full repository of guidelines - Indico platform to assist in guideline development and dissemination. - Guidelines Central – a repository of guidelines (structured at the recommendation level) whose developers contract with this company. Over 1.5 million healthcare professionals use the web and mobile APIs. - For guidelines, evaluate using AGREE II. https://www.agreetrust.org/agree-ii/		
	There are threads of work in HL7 and BPM+ community. Results of this work should be available in the coming weeks/months.		Case Study within HL7 CPG on FHIR Implementation Guide for how the C19 Digital Guideline WG supported development of the ACEP/EvidenceCare tool above.
	By end of Nov HL7 should publish details of how the DGWG got the ED use case guidance to L3.		
	Draft slide overview of VA considerations in making guidelines computable		
	Tips from DGWG, based on CPG on FHIR Implementation Guide:		
	- **Knowledge Elicitation:** This goes through types of input that are needed, what needs to be made explicit and computable. Interactions with people developing the guideline. Getting information from guidance developer tools/artifacts into a DGWG tool (based on McMaster work) for making guidance computable. The DGWG template will be made available as part of this tool. - **Terminology Management:** reach out to terminology vendors for mappings about how terms are expressed in working systems (e.g., EHRs) and connect this to how guidance developers described terms. Narrative guidelines have clinicians as an audience (e.g., understand what terms like 'patients with diabetes' mean); for guidelines to be computerized, these terms must be expressed based on computable code sets. Fleshing out these terms/definitions is the lion's share of the work in making guidelines computable. - **Execution Model:** describes target representation that models the execution semantics that are necessary for any specific implementation (Sivaram/Matt to provide example). Has 'pragmatics' that consistently conveys guidance intent. Translates what SMEs, knowledge engineers, etc. know into system behavior. There are tools to facilitate this work (e.g., OMG BPM+ tools, OWL). 'Case' describes patient details, 'Plan' describes what is (or should be) done for specific patients.		HL7 Care Management Implementation Guide COVID-19 Severity Classification and Disposition (using ACEP/EvidenceCare tool as a use case)
	The approach above is intended as a paradigm shift in the approach to developing guidance. Historically it has started with developing a text representation for the guidance that is directly applied by clinicians to enhance decisions and actions. The shift here is developing a computable representation of the guidance that serves as the 'source of truth' for subsequent implementation and modifications. When changes to the guidance model are made, these changes can then flow more seamlessly to CDS interventions, quality measures, eCase Reports, etc. This is more efficient than having a non-computable, text-based representation of the guidance as the 'source of truth,' since the former requires extensive adaptation (which introduces error, ambiguity, time delays, etc.) for implementation and modification.		
	(Sivaram/Matt to flesh this out) Use shared ontologies to ensure consistent guidelines, reduce rework. These get pulled into authoring tools...		

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	(**VA** has library of 100 knowledge artifacts - used HL7 KNART spec to make XML rendering. Using clinical content from these to represent as FHIR questionnaires. This other HL7 work outlined above resonates, and potentially could be leveraged to support VA efforts. There are only a handful of guidelines that VA pushes out from national - other CDS interventions are developed more locally by VA facilities using tools available in the HIT infrastructure. Question: How does the above process reconcile when there are competing recommendations on a particular topic. Answer: The HL7 CPG on FHIR IG addresses localization - can related to workflows, but can also reflect how organizations combine different external recommendations to make essentially a local guideline that differs from the external guidelines. There are 10 workflows and visio diagrams: Robert Lario and Linda Wedemeyer are expressing these in BPM+ as an experiment.)		

	[Evidence synthesis teams would like to have something that summarizes for a COVID resource database, where are they pulling information from, what are their inclusion/exclusion criteria, why you might use one source vs. another]		
	[CPG on FHIR team would like to incorporate insight we generate here - including BPM+ synergies, back into that resource. The 'Integrated Process' about how to develop narrative and computable guidelines in parallel - will be published in about a month.]		
	Robert Lario - co-chairs OMG BPM+ activities. 3 languages - process modeling (BPMN), decision modeling (DMN), case/event (CMMN) modeling. VA using these to express clinical practice guidelines - sometimes just instructive, other times executable. All have execution models. BPM+ has its own ecosystem. Gaps and hard to do some things with BPM +. Started working on 3 other modeling languages. Situational data - how do you represent structure of data, etc. Provenance who owns/controls and access. and Pedigree: what produces what. Knowledge Package: Many languages/constructs used in a guideline (sequencing). How do you bundle these up into a CPG. How do you surface models, discuss dependencies. Focusing on how do you express knowledge in a clear and unambiguous way, and how to you create artifacts? CPG on FHIR speaks more to methodology - complements BPM+ which doesn't get into deep detail on this. Also not looking at curation and management of models.		
	Blackford: DGWG ran through effort to implement guidance based on CPG on FHIR. Would like to use a resource like this table to know which tools to use to make guidance computable in different circumstances. How do you implement this at scale.		
	Address dissemination and marketplaces. (HL7 Marketplaces spec)		
Input Sources	- See output repositories under Produce Guidance		
Output Repositories	- CDS Connect Repository		

Standards	• CPG on FHIR (working to coordinate with BPM+, and don't yet incorporate value sets); value could be enhanced by better connection through connecting what's in CPG on FHIR to links before and after it in the ecosystem cycle. • BPM+ • Logica-led Care Management Implementation Guide [standards and guidance] to cultivate synergies between CPG on FHIR and BPM+ [in development - e.g., see info on Care Management Track at 2020-09 Connectathon]) • CDS Hooks; • SMART on FHIR • COVID-19 Interoperability Alliance Value Sets • Logica COVID-19 FHIR Profile Library IG • [under development] MCBK Standards WG Metadata work			
Initiatives				
Tools/ Platforms	• CDS Connect Authoring Tool			

Other Best Practices	**From C19HCC Digital Guideline WG:**
	
	• Using CPG-on-FHIR standard for representing/ expressing the full intent of the Guidance in computer-interpretable artifacts (part of HL7 CPG-IG)
	• Using the Agile Approach to CPG Development (inclusive of Integrated Process) to concurrently Produce Guidance and Make Guidance Computable (part of HL7 CPG-IG)
	• Use Agile Knowledge Engineering methods, principles, and tools
	  • Cross-functional Integrated team (Agile CPG Team)
	  • Leverage composite nature of CPGs (e.g. can develop logic for inferences on patient information- CPG_CaseFeatures) to build incrementally and iteratively with rapid feedback
	  • Pull knowledge engineers into Content design/reviews; pull domain SMEs into knowledge representation design/reviews
	• Leverage CPG-on-FHIR as a faithful expression of Guidance and its ability to create computationally derived CDS and Cognitive Support, patient-specific, practice-level digital Quality Measures/Metrics, eCaseReports, etc. to create computable artifacts used downstream in the Learning Health System and to provide closed-loop feedback/feedforward.
	• Leverage established tools and capabilities (e.g. BPM+ process and tooling, Clinical Ontology) to author computable Guidance and Open Source tooling to translated into HL7 CPG-on-FHIR to leverage derivative and native compute
	• tips:
	  • Use established standards and work with standards community (to understand and evolve as needed)
	  • Engage consumers/ users early and often
	  • Engage downstream vendors (e.g Terminology vendor USED in the EHRs) early
	  • Just because everyone everyone is using the same terminology systems doesn't mean they're agreeing how to use the actual terms- this needs to be considered and addressed to make ecosystem/supply chain work properly (feedforward from Evidence, but also feedback of data semantics back into evidence)
	  • Learn from related communities of practice (e.g. Agile Software Engineering)			

Implement Guidance (e.g., as CDS, eCQMs)

	General Recommendations	**Anticoagulation**	**Testing /Triage**	**Other (Long COVID, Vaccine, Steroids)**
Key Definitions and Frameworks	• Implement Guidance includes integrating the computable guidance into organizational information system infrastructure, and deploying the intervention to users, and maintaining the interventions over time. Includes looking at 'leading' indicators (e.g., process changes) regarding intervention use and results. (as opposed to the next "Analyze Care Results" table below that addresses 'lagging indicators' (e.g., clinical outcomes)) • Informatics architecture required to make computable guidelines usable. -------------------- **Regarding Terminologies:** HL7 Project "Guidelines for a Standardized Terminology Knowledge base" **Regarding Value Sets** recommend the following process (applies to anticoagulation, testing/triage, vaccines, steroids, and any other topic): 1. Take inventory of what value sets you'll need (be specific) 2. Check Alliance website or Value Set Authority Center (VSAC), we might have already published some of them among the 600+ value sets 3. If certain value sets are not present or you are unsure, contact Victor Lee (Victor_Lee@ClinicalArchitecture.com) to inquire or to request development Clinical Architecture and other Alliance collaborators are donating our efforts, and Clinical Architecture is leveraging its software tooling, hosting infrastructure, and manual labor to donate all of the COVID-19-related value set content to the public domain (i.e., completely free, no strings attached). That being said, we all have day jobs, so we appreciate having as much lead time as possible to fulfill requests. Happy to take questions. **Definition**: Implementation is the process of integrating the computable guidance into the practice system, deploying the intervention to users, and maintaining the intervention over time. The process includes pre adoption of innovation (e.g. integration of innovation into EHR, creation of policies and procedures, training, etc.), actual adoption (daily use) and post adoption (maintenance/sustainability). (See Rabin et al. 2008) **Goal**: "To assess the extent to which implementation is effective in a specific context to optimize intervention benefits, prolong sustainability of the intervention in that context, and promotes dissemination of findings into other contexts" (Damschroder, et al. 2009) **Framework**: The Consolidated Framework for Implementation Research (CFIR), a comprehensive implmentation model that consolidates a broad range of constructs from many theories (*theories related to "dissemination, innovation, organizational change, implementation, knowledge translation, and research uptake"*) *Rabin BA, et al. A glossary for dissemination and implementation research in health. J Public Health Manag Pract. 2008 Mar-Apr;14(2):117-23.* *Damschroder LJ, et al. Fostering implementation of health services research findings into practice: a consolidated framework for advancing implementation science. Implement Sci. 2009 Aug 7;4:50.*			

What to know/do (and why) Overview	For people looking for guidance repositories: • COVID-END Inventory of Resources to Support Decisionmakers for evidence on public health measures, clinical management, health systems, and social and economic issues • GIN Library of Guidelines – to search for completed, planned, or in-development guidelines • ECRI COVID-19 Guideline Resources and ECRI Library for the full repository of guidelines • Indico platform to assist in guideline development and dissemination. • Guidelines Central – a repository of guidelines (structured at the recommendation level) whose developers contract with this company. Over 1.5 million healthcare professionals use the web and mobile APIs. • For guidelines, evaluate using AGREE II. https://www.agreetrust.org/agree-ii/ **Regarding Terminologies:** HL7 Project "Guidelines for a Standardized Terminology Knowledge base" **Regarding Value Sets** recommend the following process (applies to anticoagulation, testing/triage, vaccines, steroids, and any other topic): 1. Take inventory of what value sets you'll need (be specific) 2. Check Alliance website or Value Set Authority Center (VSAC), we might have already published some of them among the 600+ value sets 3. If certain value sets are not present or you are unsure, contact Victor Lee (Victor_Lee@ClinicalArchitecture.com) to inquire or to request development Clinical Architecture and other Alliance collaborators are donating our efforts, and Clinical Architecture is leveraging its software tooling, hosting infrastructure, and manual labor to donate all of the COVID-19-related value set content to the public domain (i.e., completely free, no strings attached). That being said, we all have day jobs, so we appreciate having as much lead time as possible to fulfill requests. Happy to take questions.			
Input Sources	• See output repositories for Make Guidance Computable **Sources for Computable guidance** • Here, please add sources from where organizations can find computable guidance Implementation should follow selecting the appropriate computable guidance. If the guidance is not available in a computable format, standards should be followed to translate the knowledge into computable format first. **Process of translating the guideline text into a computable format** • FHIR • Shiffman RN, et al. Bridging the guideline implementation gap: a systematic, document-centered approach to guideline implementation. J Am Med Inform Assoc. 2004;11(5):418-426. doi:10.1197/jamia.M1444 • Tso GJ, et al. Automating Guidelines for Clinical Decision Support: Knowledge Engineering and Implementation. AMIA Annu Symp Proc. 2017;2016:1189-1198. **Criteria for selecting appropriate computable and un-computable guidance** Clinical Practice Guidelines We Can Trust (2011)			
Standards	**Successful integration of CDSs into the workflow** • Tu SW, et al. Modeling guidelines for integration into clinical workflow. Stud Health Technol Inform. 2004;107(Pt 1):174-8. • I think Matt has published something about integrating CDSs into the workflow, but I could not locate the source **Standards for implementation success** King DK, et al. Planning for Implementation Success Using RE-AIM and CFIR Frameworks: A Qualitative Study. Front Public Health. 2020 Mar 3;8:59. **Standards for Outputs** CPG on FHIR; BPM+; CDS Hooks; SMART on FHIR; COVID-19 Interoperability Alliance Value Sets; (Logica-led Care Management Implementation Guide [standards and guidance] to cultivate synergies between CPG on FHIR and BPM+ [in development]) Consolidated Framework for Implementation Research (CFIR) Modeling guidelines for integration into clinical workflow. Tu SW, et al. Stud Health Technol Inform. 2004;107(Pt 1):174-8. Standards for Inputs Implementation should follow selecting the appropriate computable guidance. If the guidance is not available in a computable format, standards should be followed to translate the knowledge into computable format first. **Sources for Computable guidance** **CDS Connect Repository** **Process of translating the guideline text into a computable format** • See "Designing Interoperable Clinical Practice GuidelinesPractice Guidelines" • Shiffman RN, et al. Bridging the guideline implementation gap: a systematic, document-centered approach to guideline implementation. J Am Med Inform Assoc. 2004;11(5):418-426. doi:10.1197/jamia.M1444 • Tso GJ, et al. Automating Guidelines for Clinical Decision Support: Knowledge Engineering and Implementation. AMIA Annu Symp Proc. 2017;2016:1189-1198. **Criteria for selecting appropriate computable and un-computable guidance** Clinical Practice Guidelines We Can Trust (2011)			
Initiatives	• C19 Digital Guidelines WG developing and implementation guide for COVID-19 interventions			

	General Recommendations	Anticoagulation	Testing /Triage	Other (Long COVID, Vaccine, Steroids)
Tools/ Platforms	- A practical guide to using the ImpRes tool - Implementation outcome instruments for use in healthcare settings - Measuring factors affecting implementation of health innovations - We need to add more about the "integration (pre adoption) piece" here - C19HCC Digital Guideline WG Implementation Guide; - HITEQ Center Guide to Improving Care Processes and Outcomes; - HIMSS Improving Outcomes with CDS - A practical guide to using the ImpRes tool - Implementation outcome instruments for use in healthcare settings - Measuring factors affecting implementation of health innovations			
Other Best Practices	- HITEQ Center Guide to Improving Care Processes and Outcomes - HIMSS Improving Outcomes with CDS - Always ensure patient's values and preferences are respected			

Analyze Care Results (Within and Across Care Delivery Organizations)

	General Recommendations	Anticoagulation	Testing /Triage	Other (Long COVID, Vaccine, Steroids)
Key Definitions and Frameworks	- Includes gathering the data that will be analyzed within and across care delivery organizations. A common reference architecture (a template or blueprint from moving data from one system to another) will help ensure that the data can be combined in meaningful ways. The standards and data harmonization initiatives mentioned below should be used with this reference architecture. 'Results' include 'lagging indicators' such as clinical outcomes. Analyzing/addressing 'leading indicators' (e.g., process changes) is addressed under "Implement Guidance" (add something explaining what we mean by 'analyze' - e.g., leveraging machine learning/AI, etc.)			
What to know/do (and why) Overview	- CPG on FHIR: describes how computable guidelines can be used to get data out of EHRs for reporting to registries, health plans, CMS using FHIR (see especially Approach section) - MedMorph IG draft (see this page - workflows for how to extract/share data from EHRs to endpoints such as public health agencies and research organizations) - Use BPM+ as a standardized way to model workflow and processes; we know how to generate evidence in a standard way; we need to share this knowledge so it can be put into practice in LHS cycle, These processes can all be represented in standard way (BPM+). This will help us be more effective at deploying knowledge in practice. Easier for those in front line to understand and implement guidance. WHO looking at using BPM in developing their L2 artifacts that they use CQL to ultimately express. - There is a Tiger Team working to implement the best that BPM+ offers for workflow modeling with what CPG on FHIR offer for decision modeling. Create an 'uber standard' - DEQM FHIR IG does similar things to what MedMorph does but focuses on *quality reporting*. Focused initially on data exchange for quality reporting, but now looking at other use cases, e.g., med reconciliation. Parallel with MedMorph, which focuses more on public health perspectives - and is therefore more robust/expansive in scope. These initiatives are communicating to support how to get FHIR data from EHRs to various different consumers. - Pay attention to data quality (details to come); need think about harmonized data quality terminology framework; 3/3 guideline for secondary use of data from EHRs - pilot of MedMorph architecture planned for March 21. Will explore whether more specific criteria for sending and receiving data can help improve data quality. - ODHSI: data harmonization and the use of data from different systems in a commonly understandable an informative method. (have outstanding data quality dashboard) - ACEP/EvidenceCare ED Severity project used CPG on FHIR, so that is a good use case for addressing this part of the cycle. Likewise for UMN work on anticoagulation. (NACHC using CPG on FHIR and MedMorph as part of addressing the full ecosystem cycle for Hepatitis B/C and HIV). - COVID patient registries: in clinicaltrials.gov; NIH COVID Cohort Collaborative - Curate data into a structured, centralized resource - applying specific instructions about how to obtain and document the data (historically a manual process to locate information but becoming more automated) - Need semantic interoperability so that results can be aggregated/compared across CDOs; should be based on widely used, open data and standards - Put information into registry (institution-specific or cross-institution) - Generate report - to get feedback about effectiveness, safety, etc. of various interventions -------------------- **Regarding Value Sets** recommend the following process (applies to anticoagulation, testing/triage, vaccines, steroids, and any other topic): - Take inventory of what value sets you'll need (be specific) - Check Alliance website or Value Set Authority Center (VSAC), we might have already published some of them among the 600+ value sets - If certain value sets are not present or you are unsure, contact Victor Lee (Victor_Lee@ClinicalArchitecture.com) to inquire or to request development Clinical Architecture and other Alliance collaborators are donating our efforts, and Clinical Architecture is leveraging its software tooling, hosting infrastructure, and manual labor to donate all of the COVID-19-related value set content to the public domain (i.e., completely free, no strings attached). That being said, we all have day jobs, so we appreciate having as much lead time as possible to fulfill requests. Happy to take questions.			
Input Sources				
Search Strategies				
Output Repositories	Registries, e.g., from specialty societies. (discuss with Frank Opelka, ACS)			
Standards	[under development] MCBK Standards WG Metadata work - standards that do (or could) underpin registries			
Initiatives	MedMorph, DEQM FHIR IG			

Tools/ Platforms	• eCQI Resource Center • UMich/MCBK Knowledge Grid efforts • MCBK UK 'knowledge hackathons' to implement NICE guidelines • AHRQ-funded toolkit for ePROs in patient care • NQF project to create a measurement framework linking quality of care delivered by telehealth, healthcare system readiness, and health outcomes in a disaster			
Other Best Practices				

Leverage Results Analysis (e.g., for Quality Improvement, Reporting, and Evidence Generation)

	General Recommendations	Anticoagulation	Testing /Triage	Other (Long COVID, Vaccine, Steroids)
Key Definitions and Frameworks				
What to know/do (and why) Overview	• Use reports (see analyze care results) • Review reports (see analyze care results) with key stakeholders • COVID-19 Evidence Accelerator - using RWE to accelerate discover -------------------- **Regarding Terminologies:** HL7 Project "Guidelines for a Standardized Terminology Knowledge base" **Regarding Value Sets** recommend the following process (applies to anticoagulation, testing/triage, vaccines, steroids, and any other topic): 1. Take inventory of what value sets you'll need (be specific) 2. Check Alliance website or Value Set Authority Center (VSAC), we might have already published some of them among the 600+ value sets 3. If certain value sets are not present or you are unsure, contact Victor Lee (Victor_Lee@ClinicalArchitecture.com) to inquire or to request development Clinical Architecture and other Alliance collaborators are donating our efforts, and Clinical Architecture is leveraging its software tooling, hosting infrastructure, and manual labor to donate all of the COVID-19-related value set content to the public domain (i.e., completely free, no strings attached). That being said, we all have day jobs, so we appreciate having as much lead time as possible to fulfill requests. Happy to take questions.		MUSC - AI for risk assessment in virtual visits	
Input Sources				
Output Repositories				
Current Standards	• EBM on FHIR/COKA (standards include: Evidence, EvidenceReport, EvidenceVariable, Group, Citation) • Vocabulary Map for Evidence-related resources [Project Google Drive] • DEQM FHIR IG • FHIR Electronic Case Reporting			
Initiatives	• MedMorph			
Tools/ Platforms				
Other Best Practices				